

REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1, 2 and 5-6 are pending in the present application. No claims are amended by the present amendment, thus, no new matter is added.

In the outstanding Office Action, Claims 1-3, 5 and 6 are rejected under 35 U.S.C. §103(a) as unpatentable over Kondo et al. (U.S. Pat. Pub. 2001/0007364, herein "Kondo") in view of Engelhardt et al. (U.S. Pat. No. 6,730,562, herein "Engelhardt").

Briefly recapitulating, Claim 1 is directed to a method of manufacturing a semiconductor device equipped with a capacitor in which a dielectric film is used, wherein a conductive complex oxide having an exposed top surface is used as a mask material when the dielectric film is subjected to reactive ion etching, and the mask material, which is in direct contact with the dielectric film, is used as an upper electrode of the capacitor after the reactive ion etching is performed, an area of a top surface of the dielectric film being equal to an area of a bottom surface of the mask material after the reactive ion etching.

In a non-limiting example described in the present specification,¹ a hard mask (for processing of the upper electrode) 11 is formed as shown in FIG. 2B, and upper SRO electrode (which serves as both an upper electrode and a hard mask) 12 (conductive complex oxide) is subjected to RIE as shown in FIG. 2C. The hard mask 11 disappears when RIE is performed. In other words, the top surface of the upper SRO electrode 12 is exposed. PZT film 13 (dielectric film) is subjected to RIE, using the pattern of the upper SRO electrode 12 as a mask (refer to FIG. 2D). As a result, the width of the upper SRO electrode 12 (which is the mask) defines the width of the PZT film 13, and the edge portions of the surface of the exposed upper SRO electrode 12 are etched. In other words, the area of the bottom of the

¹ Present specification at page 23, line 12 to page 24, line 20.

upper SRO electrode 12 (which is the mask) is equal to the area of the top of the PZT film 13, as is shown in Figure 2D.

The outstanding Action cites Kondo and Engelhardt as describing the features recited in Claim 1. Specifically, Kondo is cited on pages 2 and 3 as describing a complex oxide (40 or 40b) and a dielectric film (38 or 74). However, there is no description or suggestion in Kondo that the complex oxide (40 or 40b) is used as a mask when the dielectric film is subjected to an etch process. In paragraph 0061 of Kondo a dry etching process is mentioned, however this description is in reference to the structure of Figure 5A which shows the complex oxide (40) covered by a PT film 44. There is no evidence that the SRO film (40) of Kondo is used as a mask for a dielectric film. Although, Figure 7A shows the SRO film (40 or 46a) without the PT film 44 covering, there is no description with respect to how this capacitor is formed or if the SRO is used as a mask for etching the PZT (38) film.

In other words, Kondo discloses a structure of an already-processed SRO/PZT/SRO capacitor. However, Kondo is completely silent about a mask material or what type of mask is used for processing the PZT and the lower SRO electrode.

In addition, there is evidence that the upper SRO electrodes 40 and 40b are not used as mask materials at the time of performing etching on dielectric films (PZT 38, 74). For instance, when an upper electrode is used as a mask material at the time of performing reactive ion etching on a dielectric film, it is expected that the upper edges of the upper electrode will be cut off. FIG. 2D of the present disclosure shows a non-limiting example of this process in which the upper edges of the upper SRO electrode 12 are cut off. In contrast, FIGS. 7A and 11A of Kondo show that neither of the upper edges of the upper SRO electrodes 40 and 40b are cut off. Therefore, it is clear that a typical etching process must have been employed for the structures in FIGS. 7A and 11A of Kondo, where a mask was

arranged above the upper SRO electrode, and using this mask, etching was performed on the upper SRO electrode and the dielectric film at the same time.

Thus, Applicants respectfully submit that there is no description or suggestion in Kondo of a conductive complex oxide having an exposed top surface that is used as a mask material when the dielectric film is subjected to reactive ion etching, and the mask material, which is in direct contact with the dielectric film, is used as an upper electrode of the capacitor after the reactive ion etching is performed, as is recited in Claim 1.

In addition, the outstanding Action relies on Engelhardt as curing the deficiencies of Kondo with respect to the claimed invention.

Engelhardt describes dry etching of an upper electrode and dielectric film. However, Engelhardt does not cure the deficiencies of Kondo with respect to the above noted features recited in Claim 1.

Accordingly, Applicants respectfully submit that Claim 1 and claims depending therefrom patentably distinguish over Kondo and Engelhardt considered individually or in any proper combination.

Consequently, in view of the present amendment and in light of the above comments, no further issues are believed to be outstanding, and the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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